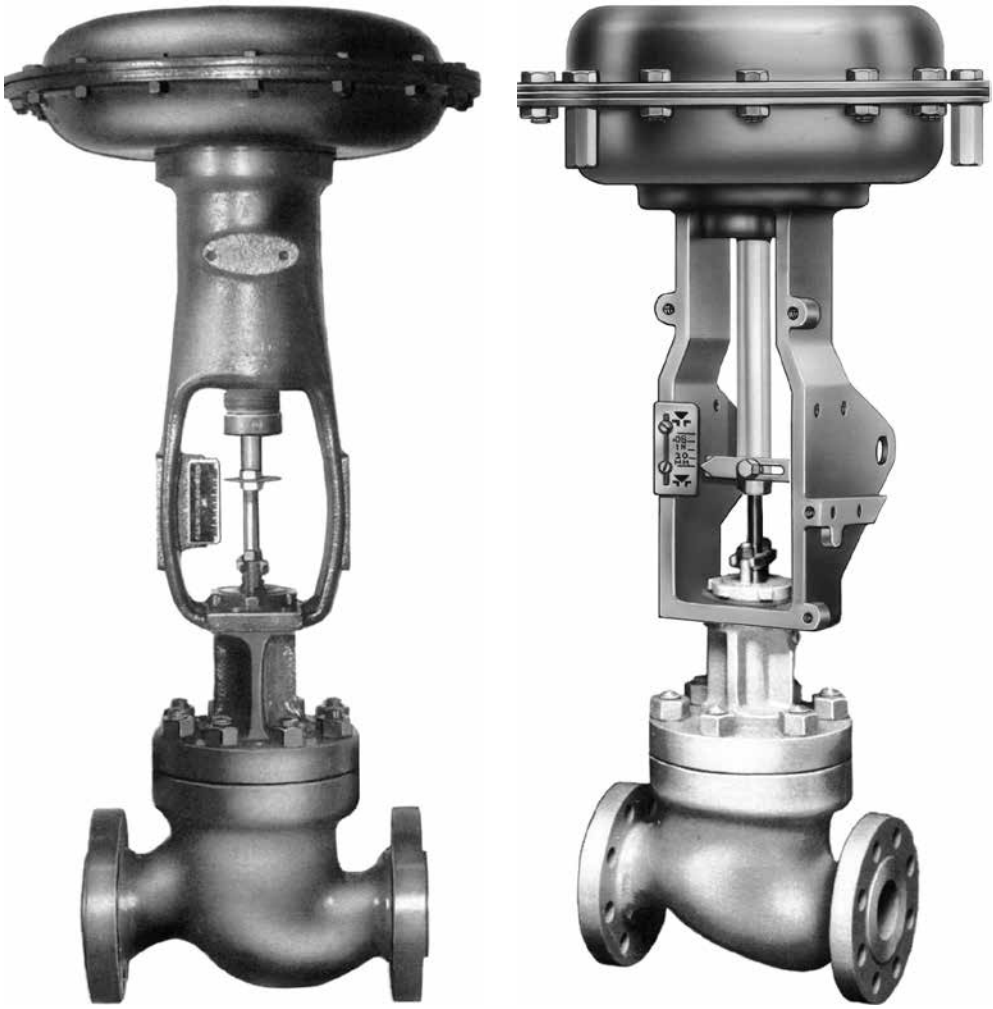
41005 Series

Masoneilan* Cage Guided, Balanced Globe Valve Tech Spec



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1. General

Important

This document contains all the instructions required for the installation, operation and maintenance of the equipment.

Regular maintenance, strict observance of these instructions and the use of manufacturer's replacement parts will guarantee optimum operation and reduce maintenance costs.

1.1 Scope

The following instructions are designed to guide the user through the installation and maintenance of the 41005 series valves for all sizes and all pressure classes.

1.2 Serial Plate

The serial plate is usually fixed to the side of the actuator yoke. It indicates, amongst other things, the type of valve, the pressure class, the material used for the pressurized chamber and the air supply pressure of the actuator.

1.3 After Sales Service

GE offers it clientele an After Sales Service comprising highly qualified technicians, for the operation, maintenance and repair of its equipment. To benefit from this service, contact our local representative or the After Sales Service of the factory whose address is given at the end of the document.

1.4 Spare Parts

When carrying out maintenance operations, only manufacturer's replacement parts must be used, obtained through our local representatives or our Spare Parts Service.

When ordering spare parts, the model and serial numbers indicated on the manufacturer's serial plate must be given.

The recommended spare parts are indicated in the parts list included in this instruction manual on page 20.

1.5 Actuator and Other Accessories

The valve is equipped with an actuator; like all the other valve accessories, actuators are the subject of special instructions which provide information on the electric and pneumatic connections. The instruction manuals to be used for standard actuators are No. ER30004E for types 37/38, No. ER8788 for types 87/88.

2. Numbering System

Actuator (2 Digits)	Body S/A (5 Digits)				
Actuator Type and Action on Air Failure	**Body Series**	**Balanced Plug Seal Type**	**Trim Type/Characteristic**	**Design Series**	**Optional Config.**
Conventional 37 – Open 38 – Close Cylinder 51– Double Acting 52 – Open 53 - Close Multispring 87 – Open 88 – Close	41 Cage guided globe	0. Undefined 3. Pressure energized PTFE seal ring 4. With pilot 5. With seal ring 6. With PTFE seal 9. Graphite seal ring	0. Undefined 1. Standard cage/Linear 2. Standard cage/Equal percentage 3. Lo-dB®/ anticavitation single stage/Linear 4. Lo-dB® single stage with diffuser/Linear 5. Lo-dB® double stage/Linear 6. VRT (stack) TYPE S/Linear 7. VRT (stack partial)/Type S/ modified percentage 8. VRT (cage) TYPE C/Linear 9. Anticavitation double stage/Linear (1)	5	A. Angle Body EB. Extension bonnet C. Cryogenic extension bonnet

Note: This instruction manual describes all the standard options in the 41005 valve series. To satisfy the particular

conditions of your application, GE may have had to develop a special option which is the subject of an additional clause to this instruction manual. In this case, the instructions given in the additional clause always take precedence over the general instructions.

3. Installation

3.1 Cleanness of Piping

Before installing the valve in the line, clean piping and valve of all foreign material such as welding chips, scale, oil, grease or dirt. Gasket surfaces must be thoroughly cleaned to insure leak-free joints.

3.2 Isolating By-Pass Valve

To allow for in-line inspection, maintenance and removal of the valve without service interruption, provide a manually operated stop valve on each side of the control valve and a manually operated throttling valve in the by-pass line.

3.3 Heat Insulation

In case of heat insulated installation, do not insulate the valve bonnet and take protection measures related to personal safety.

3.4 Hydraulic Test and Cleaning of Lines

During this operation, the control valve must not be used as an isolating valve.

This means that the valve must always be opened before carrying out pressure tests in the process line, cleaning of pipes, etc., otherwise equipment damages or destroying of seal rings could result.

3.5 Flow Direction

The valve must be installed so that the controlled substance will flow through the valve in the direction indicated by the flow arrow located on the body.

4. Disassembly

4.1 Removal of Actuator

(Figures 15 and 16)

Access to the internal components of the body should be accomplished with the actuator removed. To carry out this operation, follow the instructions below and refer to the specific actuator instructions, reference ER 8788 for a type 87/88 actuator and ER 30004 E for the type 37/38 actuator.

4.1.1 Disconnection of instruments

Disconnect all mechanical couplings between the positioner and the other instruments on the one hand and the valve stem/actuator stem coupling on the other hand.

4.1.2 Plug stems screwed into the actuator stem

In the case of air-to-retract actuators, apply sufficient air pressure on the diaphragm to retract the stem completely.

Loosen the counter-nut, unscrew the stem.

Caution: During this operation, make sure that the plug does not turn when it is seated. If the plug travel is very small and there is a large amount of plug stem inside the actuator, it may be necessary to remove the yoke nut and lift the actuator so that the plug is not touching the seat.

4.1.3 Stems attached with a stem connector

In the case of air-to-retract actuators, apply sufficient air pressure on the diaphragm to retract the stem completely.

Loosen the screws and remove the stem connector.

4.1.4 Removal of actuator

Disconnect all the ingoing and outgoing air and electrical connections from the actuator. Loosen the yoke nut or attachment screws and lift the actuator, making sure that the concentricity and/or the thread of the bonnet is not damaged.

4.2 Opening of the Pressurized Chamber

(Figures 17, 18 and 19)

Danger: Prior to disassembly, vent the process pressure and isolate the valve if necessary.

Note: The valve must always be reassembled with new packing rings and gaskets; before disassembly, make sure that the appropriate parts are available.

A. Remove the packing flange nuts (3) then remove the packing flange (4) and the packing follower (23).

B. Check that the exposed part of the valve plug stem (1) is clean enough for the bonnet (7) to be removed easily.

C. Remove the body stud nuts (8).

D. By means of a pad eye secured instead of the actuator, lift the bonnet (7) up and separate it from the valve body (18). During this operation, the valve plug stem (1) must be pushed downwards so that the valve plug remains in the valve body (18).

E. Remove the spring washer (17) and the body gasket (10).

F. In the case of type 41305, 41375, 41505, 41605 and 41905 valves, remove the valve plug stem (1) and valve plug (15) assembly from the cage by pulling the valve plug stem upward, then remove the cage (16) and "stack" (37) assembly for 41375 type valve.

Caution: Because of the cage gasket (31), the cage can sometimes be lifted along with the valve plug. If this should happen, press down on the cage so that it remains in the body. If the cage is lifted along with the valve plug, it could slip during handling and fall

In the case of a 41905 series valve [equipped with a graphite ring (45)], make sure that the ring is not damaged during the operation.

G. In the case of a 41405 valve, remove the valve plug and body cage assembly by pulling the valve plug stem upward; in this case, the valve plug has a shoulder which prevents the cage from falling. Remove the valve plug from the cage by pulling on the end of the valve plug stem.

H. Remove the seat ring (13) and the seat ring gasket (14) from the valve body (18).

I. Remove the packing (6), the packing spacer (5) and the guide bushing (22) from the bonnet (7).

Note: A packing spacer (5) is only mounted when the bonnet has a side connection.

4.3 Disassembly of Valve Plug Stem

The valve plug stem is screwed and pinned into the valve plug (15).

To dismount the stem, the valve plug must be held as indicated below, taking care not to damage the guiding surfaces; the plug stem pin (9) is then removed. By means of flats or using a nut and counter-nut on the end of the stem, unscrew the stem taking care not to apply a bending moment which could deform it.

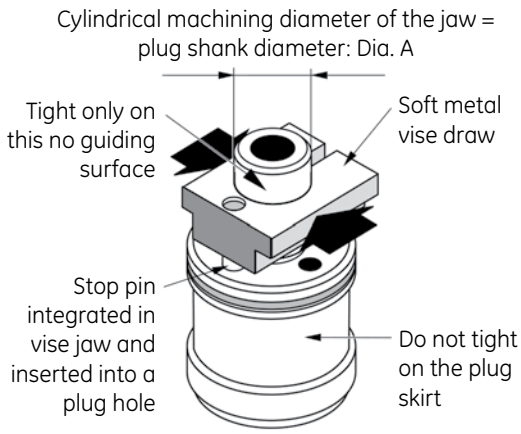

Cylindrical machining diameter of the jaw = plug shank diameter: Dia. A
Tight only on this no guiding surface
Soft metal vise draw
Stop pin integrated in vise jaw and inserted into a plug hole
Do not tight on the plug skirt

Figure 1

4.4 Disassembly of the Auxiliary Pilot Plug

When the valve is of the 41405 type.

In the case of 50, 80 or 100 mm (2", 3" or 4") valves (Figure 17).

Exert a sufficient force on the auxiliary pilot plug (20) to compress the spring washers (12). The retaining ring (19) can then be removed, releasing the auxiliary pilot plug and spring washers.

In the case of 150 to 400 mm (6" to 16") valves (Figure 17).

To carry out this operation safely, screws of the diameter and length indicated in the table in Figure 2 must be used. Thread the socket head cap screws through the holes in the auxiliary pilot plug (20). Tighten until the retainer ring (19) can be removed. Loosen the screws gradually. Remove the auxiliary pilot plug and the spring (12).

Valve size		Pilot Dismounting Screws Size			
mm	in.	Qty.	Length		Dia.
			mm	in.	
150	6	2	57	2.25	1/4" – 20 UNC 2A
200	8	2	70	2.75	3/8" – 16 UNC 2A
250	10	2	63.5	2.5	
300	12	3	101.5	4	
400	16	3	63.5	2.5	

Figure 2

5. Maintenance – Repair

5.1 Packing Box

Tightness of the packing box is obtained by compression of the packing (6). Compression must be achieved by evenly tightening the packing flange nuts (3) on the packing flange (4). Periodical retightening of the packing flange nuts is required to maintain tightness.

Make sure that the packing is not over tightened as this could prevent smooth operation of the valve. If a leak persists after the packing has been compressed to a maximum, the packing needs to be changed.

A packing spacer (5) is only mounted when the bonnet has a side connection.

5.1.1 Carbon/PTFE and pure PTFE packing rings

Carbon/PTFE and pure PTFE packing rings are cut in such a way that they can be replaced without having to separate the valve plug stem from the actuator stem.

A. Unscrew and remove the packing flange nuts (3).

B. Lift the packing flange (4) and packing follower (23) up along the valve stem.

C. By means of a puller, remove the packing (6) and packing spacer (5), taking care not to damage the sealing surface of the packing box lantern or the valve plug stem.

D. Replace the packing rings, with the cut in each ring placed about 120° from the next, pressing them down one at a time and respecting the table below:

Carbon/PTFE and pure PTFE packing box			
Number of rings			
N.D. mm (in.)	without side connection	with side connection	
		on top of packing spacer	under packing spacer
50 (2")	6	2	4
80 – 100 (3" – 4")	8	3	5
150 to 600 (6" to 24")	7	2	5

Figure 3

E. Put the follower (23) and the packing flange (4) back on.

F. Screw and tighten the packing flange nuts (3) without cramming the packing rings.

G. Put the valve back into service and check for tightness. Tighten packing flange nuts (3) as required.

5.1.2 Graphite packing ring

To carry out this operation, the valve plug stem must be removed. See chapter on actuator disassembly.

A. Loosen and remove packing flange nuts (3).

B. Remove packing flange (4), and packing follower (23) from the plug stem.

C. By means of a puller, remove packing rings (6), insuring not to damage the sealing surface of packing box or plug stem.

D. Replace new packing set (6); first one back-up ring (Carbon/Graphite braided ring), then expanded graphite rings (smooth rings), at last, one other braided back-up ring; it is important to press the rings down one at a time in the packing box.

Number of packing set	Number of rings		
N.D. mm (in.)	Braided	Graphite	Braided
50 (2")	1	4	1
80 – 100 (3" – 4")	1	6	1
150 to 600 (6" to 24")	1	5	1

Figure 4

E. Put the follower (23) and packing flange (4) back on.

F. Screw and moderately tighten the packing flange nuts (3).

G. Reassemble the valve plug stem (see chapter on actuator re-assembly).

H. Open and close the valve several times then tighten the packing.

I. Put the valve back into service and check for tightness. Tighten packing flange nuts (3) as required.

5.2 Repair of Parts

Before re-assembly, the parts must be carefully examined in order to eliminate any scratched, worn or damaged parts.

5.2.1 Guiding surfaces

The guiding surfaces of the cage and valve plug, the guide bushing, and the guiding surfaces of the plug stem and auxiliary pilot plug must be checked in particular. If

there is only slight damage, a light abrasive can be used.

Otherwise the part must be replaced as soon as possible (see paragraph "Spare parts").

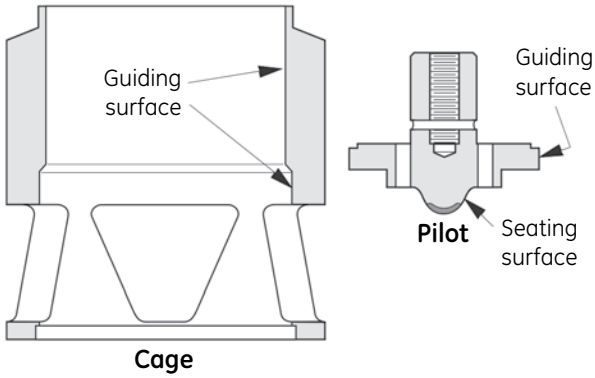


Figure 5

5.2.2 Sealing surfaces (Figure 6)

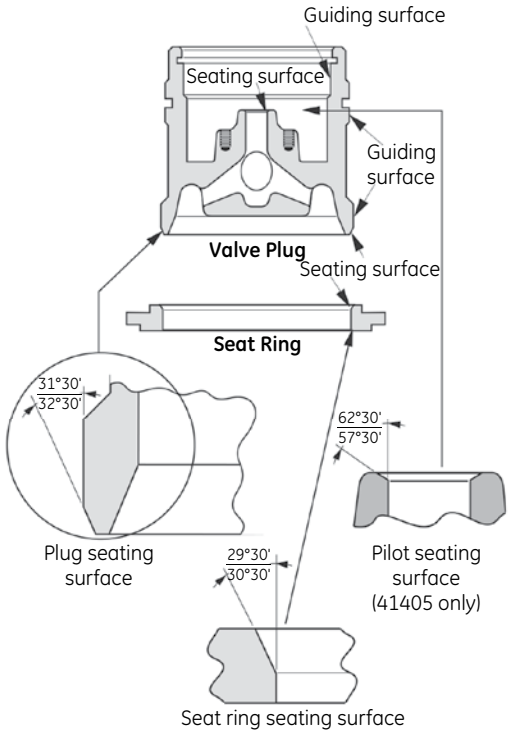


Figure 6

If the surface of the auxiliary pilot plug (20) is damaged, the auxiliary pilot plug must be replaced (see paragraph "Spare parts").

The seat ring (13), plug and auxiliary pilot plug (20) seating surfaces must be completely free of dents, wear and scratches.

If the auxiliary pilot plug seat in the valve plug (15) and/or other valve plug or seat ring seating surfaces show signs of slight deterioration, they can be touched up on a lathe.

However, not more than 0.25 mm (0.010") of metal must be removed in the case of a 50, 80 or 100 mm (2", 3" or 4") valve or more than 0.4 mm (0.015") in the case of a 150 to 400 mm (6" to 16") valve. Make sure that the seating angle indicated in Figure 6 is respected.

If a slight defect exists on any of the above seating surfaces, lapping can be envisaged, in which case the following must be respected:

- Spread a fine layer of high quality sealing compound on the seating surface.
- Put the seat ring (13) in the body, noting the angle.
- In the case of 41305, 41505, 41605 and 41905 valves, put the cage (16) on the seat ring.
- In case of 41375 valves, put the stack (48) on the seat ring and the cage (16) on the stack.
- In the case of 41405 valves, assemble the valve plug, cage and stem (15)-(16)-(1).
- In case of 41305, 41505, 41605, 41375 and 41905, assemble the valve plug (15) and stem (1).
- Assemble the bonnet (7) and its guide bushing (22).
- Place an appropriate tool on the valve plug stem (1) to turn it.
- Lap by slightly rotating the valve plug or the auxiliary pilot plug in alternative directions. After several rotations, lift the valve plug, turn it 90°, and start again.
- Lapping can be repeated, but must be limited as much as possible so that the seat remains sufficiently narrow to guarantee tightness.
- Disassemble the parts, clean them and put them back, respecting the initial angle.

5.2.3 Gasket seating surfaces

Gasket seating surface must be free of dents, scratches and corrosion; otherwise, they will need to be repaired.

5.2.4 Seal rings and gaskets

Spiral-wound gaskets (10), (14) and (36) must always be changed after disassembly. Seal rings (11A), (11C) or (11E) can be reused if they are free of scratches, erosion and corrosion.

5.2.5 Valve plug, valve plug stem

If the valve plug has to be changed, then the stem must also be completely changed to guarantee correct pinning of the assembly. If only the valve plug stem has to be changed, then the valve plug can be reused.

6. Valve Reassembly

6.1 Pinning the Valve Plug Stem

The valve plug (15) and stem (1) assembly consists of a rod threaded into the valve plug and pinned in place.

If the valve plug (15) [or the auxiliary pilot plug (20) in the case of a 41405 valve] needs to be replaced, it is recommended using a new stem. The hole of the original pin in an old stem often prevents satisfactory results being obtained and can seriously impair the mechanical strength of the stem-valve assembly.

Assembly is carried out as follows:

6.1.1 Reference marking on the valve plug stem

Make a reference mark on the valve plug stem at a distance "X" (Figures 7 and 8), equivalent to the stem recess in the valve plug.

Note: For shouldered plug stems with two flats, the above marking is unnecessary.

6.1.2 Tightening of the plug stem

To carry out this operation, the valve plug must be prevented from moving by holding the plug shank with an appropriate tool.

Screw two nuts on to the end of the new plug stem and lock them together. Screw the valve plug stem solidly into the plug, checking that the reference mark is level with the end of the plug shank.

If the stem has flats, apply a torque "T" using a wrench of dimension "E" (see Figure 7).

6.1.3 Drilling the pin hole (Figures 7 and 8)

Note: For this operation, it is recommended clamping the valve plug-stem assembly by the plug shank to avoid damaging the guiding surfaces; particular care must be taken so that the pin hole goes through the valve plug axis.

If the valve plug is new, drill a hole of diameter "C" at a distance "D" from the end of the valve plug; choose the diameter "C" from the table according to the type of pin used (metric or Anglo Saxon pin).

If the hole is already drilled in the valve plug, use the hole as a guide to drill through the valve plug stem.

Valve plug stem diameter B	Diameter A	Metric pin, diameter C	Anglo-Saxon pin dia. C	F	D	Distance X	E	Torque T	
								Non-Shouldered stem	Shouldered stem
mm (in.)	mm (in.)	mm	In.	mm (in.)	mm (in.)	mm (in.)	mm (in.)	N.m (Ft.lbs)	N.m (Ft.lbs)
12.7 (1/2)	20 (.79)	3.5	0.14	18 (.70)	18.5 (.73)	6 (.24)	17 (11/16)	50 (37)	60 (44)
15.87 (5/8)	25.5 (.98)	5.0	0.2	24 (.95)	28 (1.1)	8 (.30)	22 (7/8)	50 (37)	160 (118)
19.05 (3/4)	35 (1.38)	5.0	0.2	30 (1.2)	45 (1.77)	19 (.75)	27 (11/16)	160 (118)	160 (118)
25.4 (1.0)	44.5 (1.66)	8.0	5/16	40 (1.58)	47.5 (1.88)	25 (.98)	30 (11/4)	160 (118)	250 (184)
31.75 (1 1/4)	58 (2.28)	8.0	5/16	55 (2.20)	70 (2.76)	31.5 (1.24)	40 (1 5/8)	-	800 (590)
38.1 (1 1/2)	70 (2.76)	10.0	-	65 (2.56)	90 (3.54)	33 (1.30)	50 (2)	-	1 500 (1100)

Figure 7

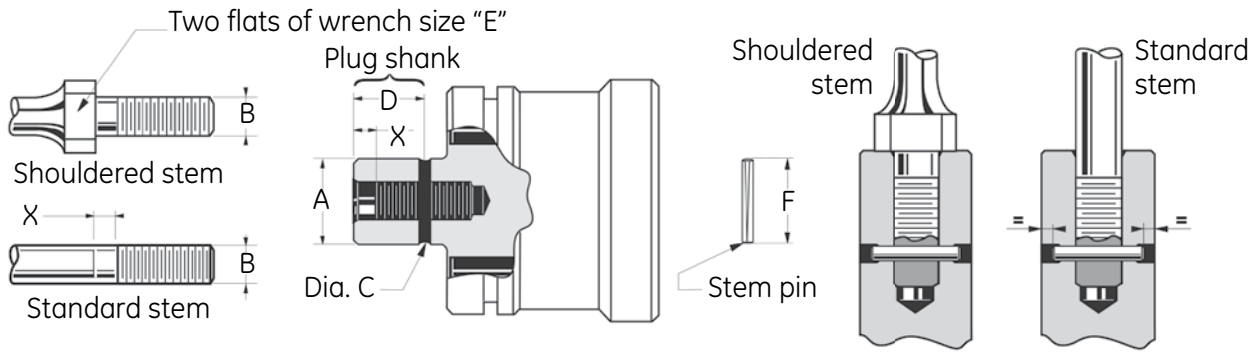


Figure 8

6.1.4 Pinning

By means of a hammer, introduce the pin into the hole. Complete the pinning operation, taking care to ensure that the pin is recessed by the same amount at both sides.

Using a ball tooling and hammer, caulk the pin hole edge of the plug.

Place the assembly in the soft jaw chuck of a lathe to check alignment of the two parts; correct any alignment defects.

6.2 Assembly of Ring or Spring-Energized Seal Ring

6.2.1 41305 valve

(Figures 9, 18 and 19)

These valves have a spring-energized seal rings composed of a PTFE-based jacket maintained expanding by a spring.

To insert the ring into the plug groove:

- Lubricate the entry chamber.
- Place the ring over the conical top of the plug so that the lips of the ring face to the pressure (see Figure 9).

Caution to the assembly direction of the radial ring (11F) on the plug (see Figure 9).

Flow Tends to Open: the open side is in the top.

Flow Tends to Close: the open side is in the lower part.

- Slip to the ring into the groove (without spinning it) as shown in Figure 9. This operation can be facilitated by heating the ring. The temperature of the ring should not exceed 150°C.
- Keep the ring retained until it returns to room temperature and goes back in place within the groove. Clamping with a collar (SERFLEX type) will help to properly position the ring.

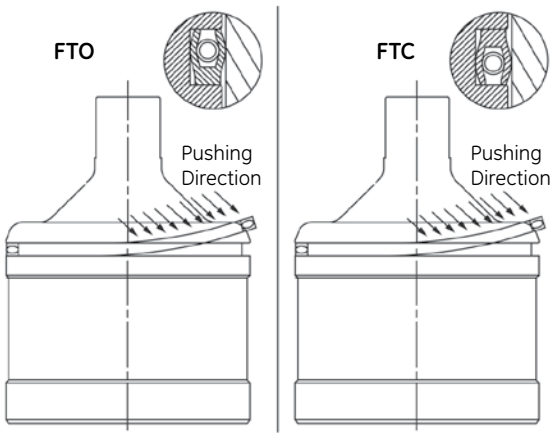


Figure 9

6.2.2 41405 and 41505 valves

(Figures 17 and 19)

These valves are equipped with metal rings; the inner ring has a straight cut while the outer ring has a staggered cut.

To insert the rings into the cage groove, open the rings slightly by hand and slide them, one after the other, along the plug making sure that the parts are not damage.

Note: The cuts in the outer and inner rings are to be placed at about 180° from each other.

6.2.3 41605 valve

(Figure 19)

These valves are equipped with an inner elastomeric ring and a PTFE gasket.

Insert the elastomeric ring (11D) in the groove.

Place the PTFE gasket (11C) at a temperature of 100°C (boiling water) to 160°C for a few minutes to facilitate insertion, then slide along the plug until it slips into the groove.

For optimum insertion of the ring, a Serflex type ring compressor can be used to compress the ring in the groove for several minutes.

6.2.4 41905 valve

(Figure 19)

These valves are equipped with rings; the inner metal ring has a straight cut and the outer ring is made of graphite.

The new graphite seal ring (11A) is supplied in the form of a closed ring in which a notch must be cut before being inserted.

Caution: Graphite seal rings are fragile and the following operations must be carried out very carefully.

Using a sharp blade, carry out two V notches on the two opposite faces. Hold the ring on either side of the notch between the thumb and index and bend until it breaks.

Using a very fine file, adjust each end of the ring so that its external circumference corresponds to the internal circumference of the inside diameter of the cage (16).

To adjust the length of the ring correctly, insert the new graphite ring into the cage, with the ring against the inner wall of the hole in the cage, allowing minimum play between the two ends of the ring.

To insert the inner ring, then the graphite ring into the cage groove, slightly open the rings by hand and slide them one after the other along the plug, taking care not to damage the parts.

Note: The cuts on each ring are to be placed at about 180° from each other.

6.2.5 41375 high temperature valve (232°C to 316°C)

(Figure 19)

These valves are equipped with a seal ring composed of a jacket and a metallic spring and two backup rings (11G).

Assemble the different parts as shown in Figure 19, starting by the backup rings.

Caution: put these parts as shown in Figure 19, the angle of 90° of the backup ring in front of the extrusion gap between cage and plug.

6.3 41405 Valve Plug and Cage Assembly

(Figure 17)

6.3.1 Assembly of valve plug and auxiliary pilot plug

Assemble, as appropriate, the flat spring or the coil springs then the valve plug/plug stem assembly.

Using the same tools as those used for disassembly (see chapter "Disassembly"), compress the springs so that the retaining ring can be inserted in the groove of the main plug.

6.3.2 Assembly of cage

Place the cage over the valve plug assembly via the top of the plug stem. When doing so, take particular care to position the ring correctly.

6.4 Assembly of the Parts Inside the Valve Body

(Figures 17, 18 and 19)

Proceed as follows:

- After checking that the surfaces are perfectly clean, place the seat gasket (14) in the valve body, making sure that it is centered as well as possible.
- Mount the seat ring or the diffuser seat (13).
- Mount:
  - The cage (16) for 41305, 41605 and 41905 valves,
  - The cage/plug/stem assembly for 41405 valves,
  - The STACK assembly (making sure that the face with the smallest number of holes is in contact with the seat ring), and cage (16) for 41375 valves.

Caution: for the double-cage assembly, carry out the following operations:

- Put the inner cage (16) upside down,
- Encase the outer cage (75) on the inner cage, maintain them together with the two pins (76).
- In the case of valves other than 41405 valves, insert the valve plug/stem/ring assembly into the cage taking particular care as it goes past the ring or spring-energized seal ring.
- In the case of valves with a N.D. less than 150 (6"), place the body/cage gasket in the valve body, making sure that it is centered as well as possible.
- For valve sizes 150 to 400 mm (6 to 16"), insert either the cage gasket (24) or the flat spring washer (17).
- For valve sizes 450, 600 and 750 mm (18, 20 and 24"), insert either the first cage gasket, the cage washer and the second cage gasket or the flat spring depending on the type of valve, then place the body gasket (10) in the valve body making sure that it is centered as well as possible.

Caution to the direction of assembly of spring washer:

- ND 150 (6") to 450 (18") valves, the concave face is upwards,
- ND 500 (20"), and 600 (24"), the concave face is downwards and the tapped holes are visible.

6.5 Assembly of Bonnet

Check that the packing ring (6), the spacer (5) and the guide bushing (22) have been removed from the bonnet.

Position the bonnet (7) above the valve, so that the packing flange studs (2) are perpendicular to the flow direction of the valve.

Thread the bonnet (7) onto the valve stem (1) and push it down carefully until it goes into the valve body studs (21) and takes up its correct position.

Grease the threads of the valve body studs (21) and the bearing surfaces of the body stud nuts (8).

Screw on the body stud nuts by hand. Tighten the nuts lightly and evenly so that the internal parts are held in place. The face of the bonnet should be parallel to the upper face of the body.

Slide the guide bushing (22) onto the valve plug stem and let it drop to the bottom of the packing box housing.

6.6 Tightening of Body Stud Nuts

Alignment of internal parts

In order to achieve perfect alignment of the seat ring and the valve plug, a force must be applied to the plug stem during tightening of the bonnet which results in correct relative positioning of the two parts.

The force can be applied with the pneumatic actuator as follows:

Place the actuator on the valve bonnet (7) by means of the yoke nut (33) or attachment screws and connect the valve plug stem to the actuator stem. See chapter on actuators for installation instructions.

Caution: During this operation, make sure that the plug does not turn when it is seated. If the plug travel is very small and there is a large amount of plug stem inside the actuator, it may be necessary to remove the yoke nut and lift the actuator so that the plug is not touching the seat.

Align the internal parts as follows:
In the case of air-to-extend actuators, supply air to the actuator at the maximum pressure indicated on the serial plate and in the case of spring-to-extend actuators, do not supply air to the actuator, so that the optimum positioning of the valve plug and seat can be obtained.

Single bolting circle:
Evenly tighten the nuts (8) by applying the torque indicated in table in Figure 10 and the tightening sequence in Figure 11.

Double bolting circle:
Beginning by the internal nuts, manually screw all the bolts. Screw the internal nuts in order indicated by the Figure 2 and screw them by successive, uniform and progressive levels. During the tightening, make sure that the bonnet face stays parallel at that of the body. When the torque values given in the following table are reached, the bonnet face must be in contact with that of the body. Screw the external nuts in order indicated by the Figure 2 and screw them by successive, uniform and progressive levels until the torque values given in the following table.

Torque Valve body stud/Bonnet					
Body		Nuts (21)		Torque	
Nominal size (in)	ASME Pressure classe	Size (in)	No.	m.N	ft.lb
2 3 x 2 4 x 2	300/600	3/4 – 10	6	150	110
2	900/1500	7/8 – 9	8	250	180
	2500	1 1/4 – 8	6	550	410
3 x 2 4 x 2	900/1500	1 – 8	8	400	300
3 4 x 3 6 x 2	300/600	3/4 – 10	8	150	110
	900 / 1500 900/1500	1 1/4 – 8	6	800	600
3	2500	1 1/2 – 8	6	1050	775
4 6 x 4 8 x 4	300/600	7/8 – 9	8	250	180
	900	1 1/2 – 8	6	1200	900
	1500	1 1/2 – 8	6	1400	1000
4	2500	1 5/8 – 8	8	1250	930
6 8 x 6 10 x 6	300	1 – 8	8	400	300
	600	1 – 8	12	350	250
	900/1500	1 3/4 – 8	8	1800	1300
6	2500	1 7/8 – 8	8	1900	1400
8 10 x 8 12 x 8	300/600	1 1/4 – 8	8	700	500
	900	1 3/4 – 8	8	1900	1400
	1500	1 3/4 – 8	8	2300	1700
8	2500	1 3/4 – 8	12	1650	1220
10	300	1 1/2 – 8	8	1200	900
	600	1 1/2 – 8	12	1200	900
	900	1 3/4 – 8	12	1800	1300
	1500	1 3/4 – 8	12	2000	1500
	2500	2 – 8	12	2800	2070
12 16 x 12	300	1 1/2 – 8	8	1300	950
	600	1 1/2 – 8	12	1200	900
	900	1 1/2 – 8	16	1200	900
	1500	1 3/4 – 8	16	2000	1500
12	2500	1 7/8 – 8	20	2200	1630
16	300	1 1/2 – 8	12	1300	950
	600	1 1/2 – 8	16	1300	950
	900	1 1/2 – 8	20	1400	1000
	1500	1 3/4 – 8	20	2300	1700
	2500	2 – 8	24	2650	1960
20	300	1 3/8 – 8	24	900	650
	600	1 3/4 – 8	24	2000	1500
	900	1 7/8 – 8	24	2700	2000
24	300	1 3/4 – 8	20	1900	1400
	600	1 3/4 – 8	26	2200	1600
30	300	1 3/4 – 8	28	2000	1500

Figure 10

6.7 Assembly of Packing Box

To assemble the packing box, proceed as indicated in the "maintenance" chapter, paragraph 5.1.1 or 5.1.2.

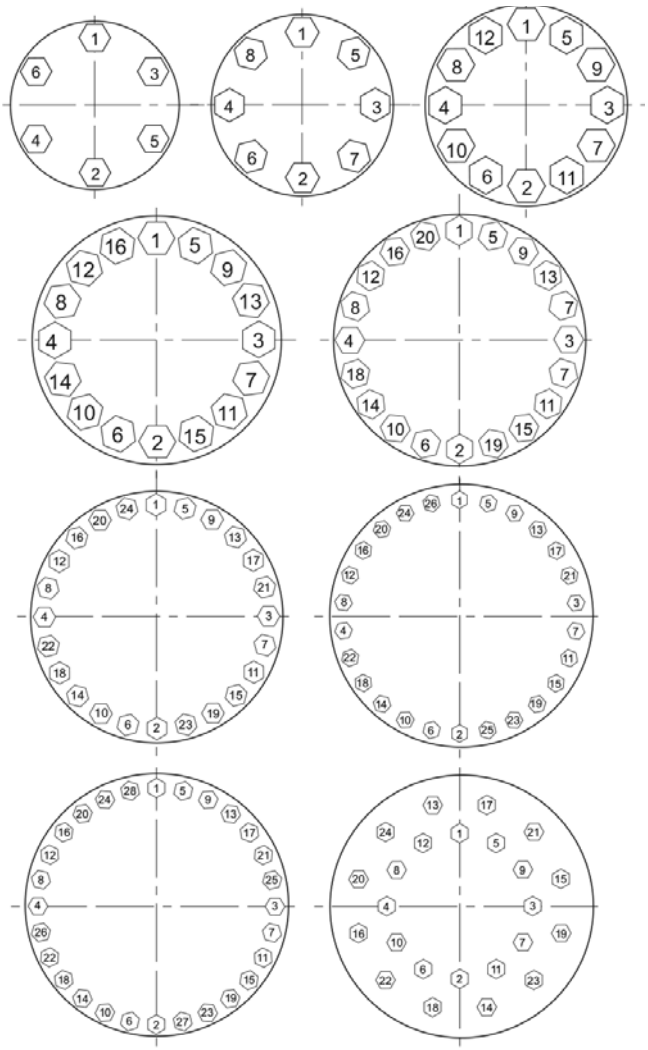


Figure 11. Tightening sequence of nuts (8)

7. Actuator

Caution: for coupling operations of actuators on valves, it is necessary as a preliminary:

- to position the plug (15) on its seat ring (13). (In no case, one should not turn the plug on its seat, to avoid any deterioration of tightness seat).
- connect a temporary air supply line to the actuator.

7.1 Coupling of Actuator Type 88 No. 6

(Figure 15)

A. Tightly screw the two hex nuts (1) onto the plug stem.

B. Push down the actuator and, at the same time, screw on the yoke nut (33), then the bottom stem connector (2). As soon as it becomes possible, insert the valve stem into the actuator stem. The stem must be inserted far enough so that when there is no air in the actuator, the valve plug does not touch the seat.

C. Tighten the yoke nut.

D. Unscrew the valve plug stem until the valve plug comes into contact with the seat. Do not turn the valve plug on the seat as this could damage the sealing surfaces.

E. Supply air to the actuator until the stem has travelled at least 10 mm.

F. Unscrew the plug stem the number of turns N1 specified in Figure 13.

Caution: in the case of 41405 valves, use the N2 valve so ensure tightness of the pilot plug.

G. Screw the 2 nuts (1) as far as they will go and check that operation is correct.

H. Use the pointer (7) to set the travel scale (9) to the closed valve position.

7.2 Coupling of Actuator Type 87 No. 6

(Figure 15)

A. Tightly screw the two hex nuts (1) onto the plug stem.

B. Push down the actuator and, at the same time, screw on the yoke nut (33), then the bottom stem connector (2). As soon as it becomes possible, insert the valve stem into the actuator stem. The stem must be inserted far enough so that, when there is air in the actuator, the valve plug does not touch the seat.

C. Tighten the yoke nut.

D. Supply air to the actuator at the initial pressure of spring range.

E. Use the pointer (7) to set the travel scale (9) to the open valve position.

F. Supply the actuator with air at a high enough pressure to obtain a travel equal to the nominal travel of the valve.

Caution: in the case of the 41405 valves, reduce the travel by value A indicated in Figure 14.

G. Unscrew the plug stem until the valve plug is in contact with the seat. Do not turn the valve plug on the seat as this could damage the sealing surfaces.

H. Screw the 2 nuts (1) as far as they will go and check that operation is correct.

7.3 Coupling of Actuator Type 87 No. 10, 16 and 23

(Figure 15)

A. Tightly screw hex nut (1) onto the plug stem.

B. Screw the top stem connector assembly tightly onto the actuator stem.

C. Push down the actuator and, at the same time, screw on the yoke nut (33), then the bottom stem connector assembly by screwing until they come into contact with the hex nut (1).

D. Push down the actuator and tighten the yoke nut.

E. Supply the actuator with air at the initial pressure indicated on the spring scale.

F. Position the stem connector assembly at distance "X" indicated in Figure 12.

G. Use the pointer (7) to set the travel scale (9) to the open valve position.

H. Supply the actuator with air at a high enough pressure to obtain a travel equal to the nominal travel of the valve

Caution: in the case of the 41405 valves, reduce the travel by value A indicated in Figure 14.

I. With the plug correctly positioned on the seat, unscrew the bottom stem connector assembly until it comes into contact with the top stem connector. Tighten the socket head cap screws (5), nuts (1) and (32) and check that operation is correct.

Actuator No	Travel		"X" Actuator 87		"X" Actuator 88	
	mm	inches	mm	inches	mm	inches
10	20	0.8	130	5.12	117.3	4.62
10	38	1.5	138.2	5.44		
16	20	0.8	203.2	8.00	178.3	7.02
16	38	1.5	228.6	8.50		
16	51	2.0	235.7	9.28		
16	63.5	2.5	241.3	9.50		
23	20	0.8	209.5	8.25		
23	38	1.5	218.9	8.62		
23	51	2.0	231.6	9.12		
23	63.5	2.5	243.6	9.59		

Figure 12. Position of top stem connector

7.4 Coupling of Actuator Type 88 No. 10, 16 and 23

(Figure 15)

A. Tightly screw hex nut (1) onto the plug stem.

B. Tightly screw the top stem connector assembly onto the actuator stem.

C. Push down the actuator and, at the same time, screw on the yoke nut (33), then the bottom stem connector assembly by screwing until they come into contact with the hex nut (1).

D. Push down the actuator and tighten the yoke nut.

E. Unscrew the top stem connector to respect dimension "X" in Figure 12.

F. With the plug correctly positioned on the seat, unscrew the bottom stem connector assembly to bring it into contact with the top stem connector.

G. Supply air to the actuator until the stem has travelled at least 15 mm.

H. Unscrew the bottom stem connector the number of turns N1 specified in Figure 13 then lock manually with hex nut (1).

Caution: for 41405 valves, use the N2 valve so ensure tightness of the pilot plug.

I. Release the pressure in actuator so that the two parts of connector come into contact and tighten the socket head cap screws and nuts (1) and (32).

J. Shut off the supply pressure in the actuator and use the pointer (7) to set the travel scale (9) to the closed valve position and check that operation is correct.

Valve size (in)	ASME class	Plug stem diameters mm (in)	N1 (turn)	N2 41405 (turn)	a mm (in)
2	150, 300 or 600	12.7 (1/2")	1.5	3.5	1.9 (0.075)
3	2500				
2	900 to 2500			3.25	
3 and 4	150 to 1500	15.87 (5/8")	1.5	3.5	2.0 0.08)
4 and 6	2500				
6	150 to 1500	19.05 (3/4")	1.25	4.25	2.0 (0.08)
8	2500				
8	150 to 1500	25.4 (1")	1.25	4.5	2.3 (0.09)
10	2500				
10, 12 and 16	150 to 1500			5	
12 and 16	2500				
18	150 to 1500				
20	150 to 900			—	
24	150 to 600				

Figure 13. Reverse actuators – seating values for 41305 – 41505 – 41605 – 41905 valves

Valve size (in)	ASME class	Value A mm (in)	Value a1 mm (in)
2	150, 300 or 600	2.5 (0.1)	4.4 (0.17)
3	2500		
2	900 or 2500	2 (0.08)	3.9 (0.15)
3 and 4	150 to 1500	3 (0.12)	5 (0.2)
4 and 6	2500		
6	150 to 1500	5 (0.2)	7 (0.27)
8	2500		
8	150 to 1500	6 (0.24)	8.3 (0.33)
10	2500		
10, 12 and 16	150 to 1500	7 (0.275)	9.3 (0.37)
12 and 16	2500		
18	150 to 1500		

A = Pilot plug travel

Figure 14. Seating value for 41405 valves

7.5 Coupling of Air-to-Extend Actuator (Type 37)

(Figure 16)

A. Push down on the plug stem (1) until the plug rests is seated.

B. Attach the actuator to the valve bonnet with the yoke nut (33) or attachment screws. Apply a sufficient pressure to the diaphragm to extend the actuator stem by the normal valve travel for valves 41305, 41505, 41605 and 41905 and the travel minus the value of A in Figure 14 for 41405 valves.

C. Assemble the two parts of the stem connector (51) and the point (58). The number of threads inside the stem connection must be approximately equal for each stem. Tighten screw(s) (52).

D. Check that the travel of the actuator stem corresponds to the normal travel of the valve and that the closed position is obtained for the maximum spring range indicated on the serial plate.

E. Shut off the air pressure. Use the pointer (58) to set the travel scale (56). The pointer (58) must indicate "open" when the air pressure is off.

7.6 Coupling of Air-to-Retract Actuator (Type 38)

(Figure 16)

A. Connect a temporary air supply line to the actuator. Apply sufficient pressure to the diaphragm to retract the actuator stem completely. Attach the actuator to the valve bonnet with the yoke nut (33) or attachment screws.

B. Shut off the air pressure completely. Increase the air pressure to retract the actuator stem by the value of a in Figure 13.

Caution: For 41405 valves, use value a1 of Figure 14.

C. Assemble the two stem connectors (51) and the pointer (58). The number of threads inside the stem connection must be approximately equal for each stem. Tighten screw(s) (52).

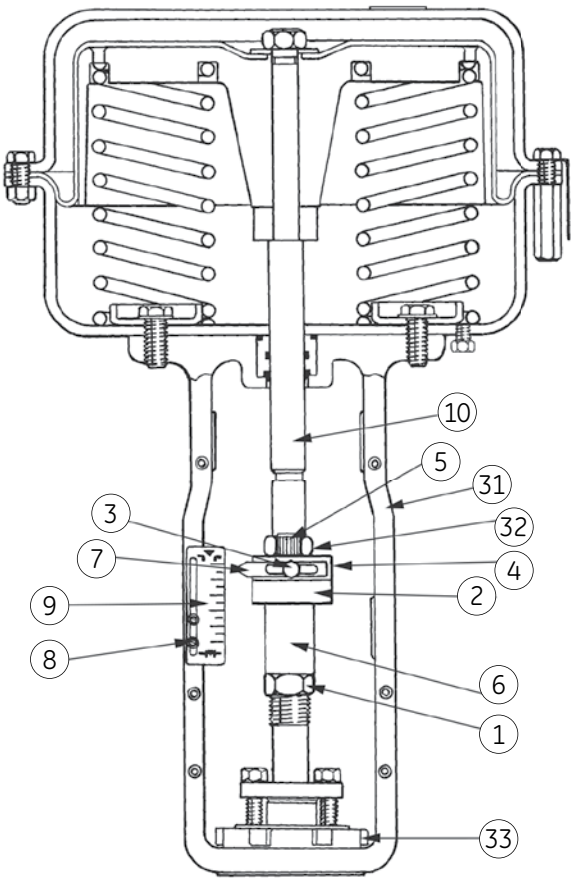
D. Check that the travel of the actuator stem corresponds to the effective travel of the valve and that the closed position is obtained for the minimum spring range indicated on the serial plate.

E. Shut off the air pressure then use the pointer (58) to set the travel scale (56). The pointer (58) must indicate "closed" when the air pressure is nil.

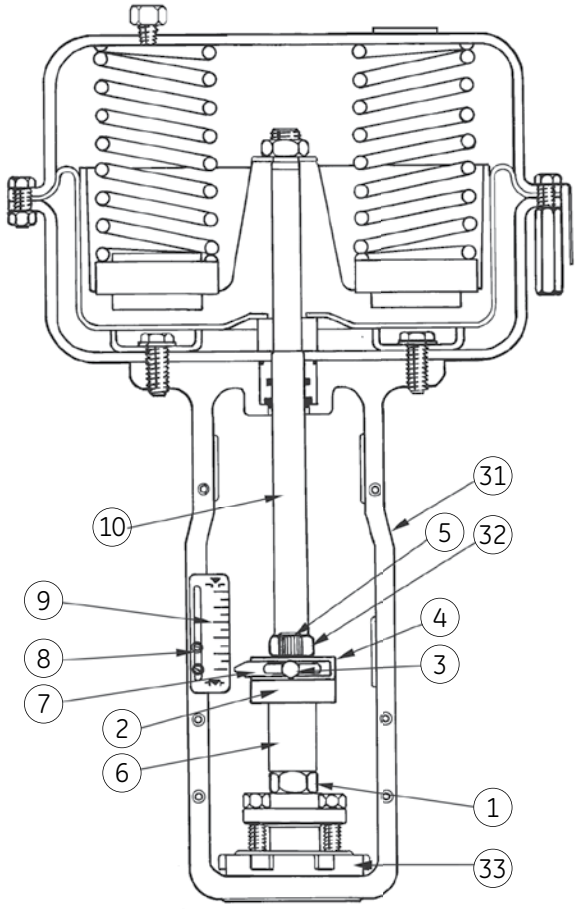
7.7 Other Types of Pneumatic Actuators

For other type of actuators which the coupling valve actuator is realized by coupling parts (see Figure 16) follow the procedure:

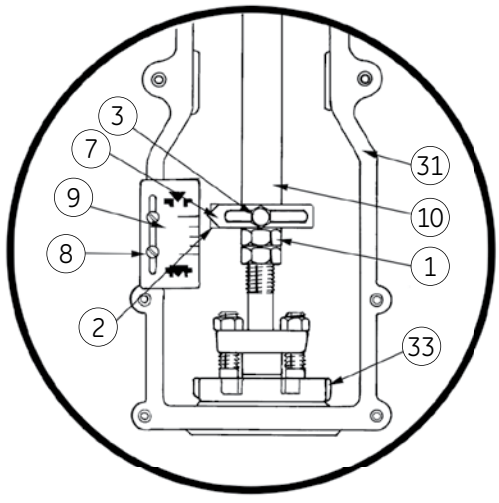
- § 7.5. for actuator opens by air failure.
- § 7.6. for actuator closes by air failure.



Model 87
No. 10-16-23



Model 88
No. 10-16-23

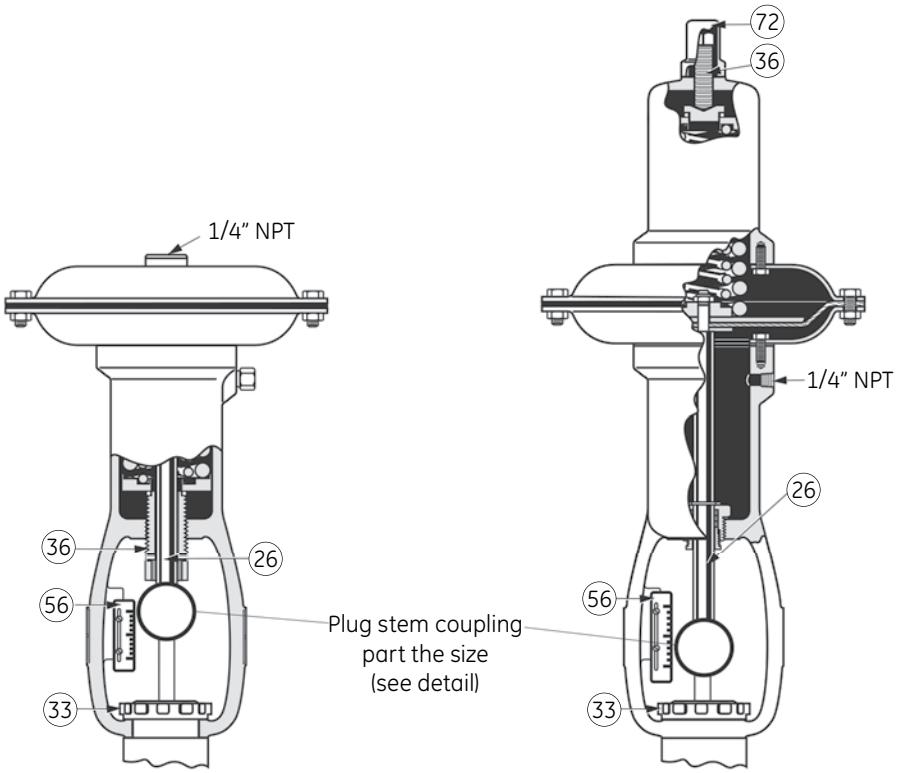


Detail of 87/88 Model
No. 6

Parts Reference	
Ref.	**Designation**
1	Hex nut
2	Bottom stem connector
3	Pointer screw
★ 4	Top stem connector
★ 5	Cap screw, soc, head
★ 6	Connector Insert
7	Pointer
8	Screw, Pan head (travel scale)
9	Travel scale
10	Actuator stem
31	Yoke
★ 32	Lock nut
33	Drive nut

★ Not provided for size 6 actuator

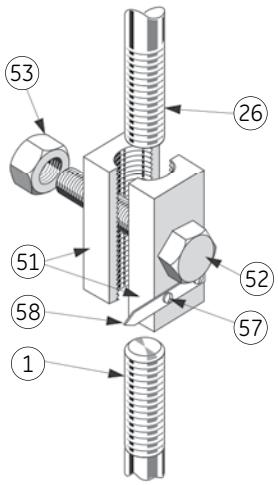
Figure 15. Spring diaphragm actuators – types 87/88 multispring



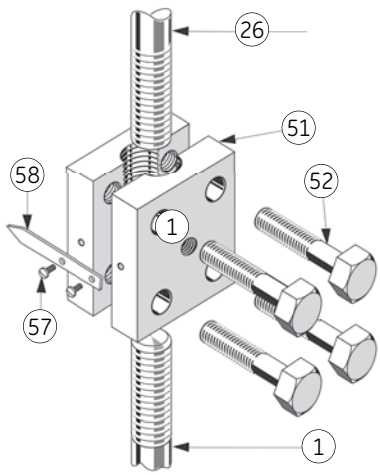
Type 37
Air-to-extend actuator

Type 38
Air-to-retract actuator

Parts Reference	
Ref.	**Designation**
1	Valve Plug Stem
26	Actuator stem
27	Stem nut
33	Drive nut
36	Spring adjustor
51	Coupling
52	Coupling screw
53	Coupling nut
55	Frein de tige
56	Travel indicator scale
57	Machine screw
58	Travel indicator
72	Spring barrel cap



Coupling parts
(No 18 and 18L actuators)

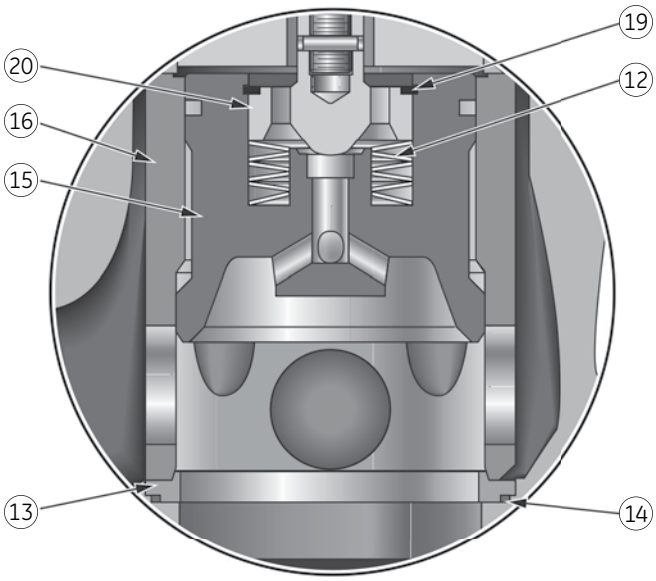


Coupling parts
(No 24 actuator)

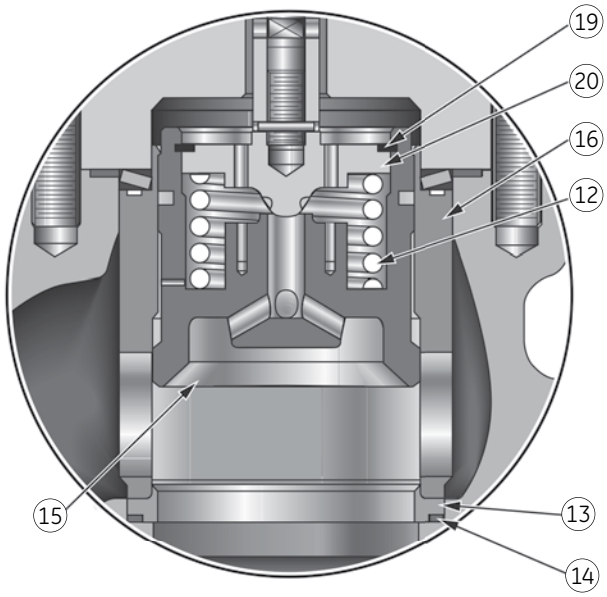
Detail of coupling types of plug stem

Figure 16. Spring diaphragm actuator 37/38 types

Body Sub Assembly



41405 TRIM: 2" to 4"



41405 TRIM: 6" to 18"

Diffuser Option

Figure 17. Internal parts of pilot plug valve – 41405 type

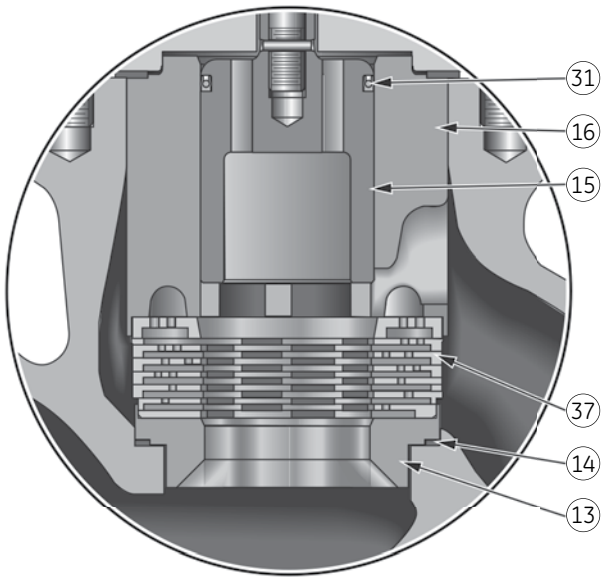
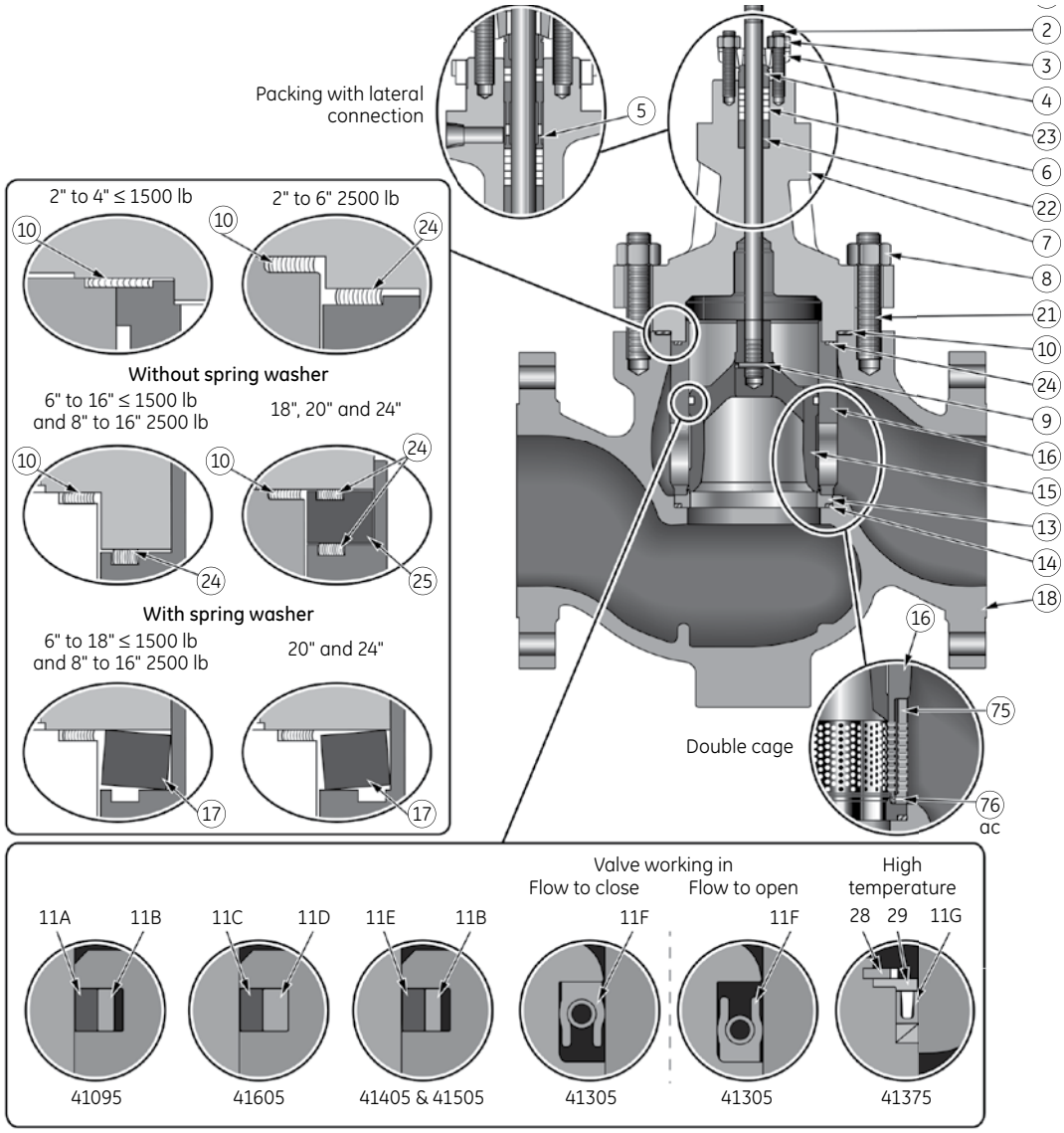


Figure 18. Internal parts of VRT anticavitation valves – 41375 type



Parts Reference									
Ref.			Designation	Ref.			Designation	Ref.	Designation
		1	Valve plug stem	★	●	11D	Elastomer seal ring	21	Valve body stud
		2	Packing flange stud	■	●	11E	Metallic seal ring	22	Guide bushing
		3	Packing flange nut	▲	●	11F	Tec seal	23	Packing follower
		4	Packing flange	❍		11G	Seal ring and backup ring	24	Cage gasket
		5	Packing spacer	❖		12	Spring (or spring washers set)	25	Cage washer
	●	6	Packing			13	Seat/diffuser seat	❍	28 Retaining ring
		7	Bonnet		●	14	Seat ring gasket	❍	29 Retainer ring
		8	Valve body nut			15	Valve plug	37	Stack
	●	9	Plug stem pin			16	Cage	50	Washer (body nuts)
	●	10	Body gasket	♦		17	Spring washer	75	Double cage
❑	●	11A	Graphite seal ring			18	Valve body	76	Pin
❑	●	11B	Metallic ring	❖		19	Retaining ring		
★	●	11C	U PTFE seal ring	❖		20	Auxiliary pilot plug		

❖ On 41405 series valves only
● Recommended spare part
▲ On 41305 series valves only
♦ On 6" to 24" valves sizes only (150 to 600 mm)
❑ On 41905 series valves only
❍ On 41375 high temperature valves only
★ On 41605 series valves only
■ On 41405/505 Series valves only

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